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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
10/001,499	11/14/2001	Ligui Zhou	0179.0029	3237

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EXAMINER

MAKI, STEVEN D

ART UNIT	PAPER NUMBER
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1733

DATE MAILED: 11/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/001,499

Applicant(s)

ZHOU ET AL.

Examiner

Steven D. Maki

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-38 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 070604
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

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1) A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8-16-04 has been entered.

2) **In view of applicant's citation of Europe 392348 in the IDS filed 7-6-04 (identified as being an "X" reference in the search report attached to the IDS and considered per the RCE filed 8-16-04), the allowable subject matter indicated in the last office action has been withdrawn. Rejections using Europe 392348 are set forth below:**

3) The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4) Claims 1-16 and 23-34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, there is no clear antecedent basis for "said prepreg resin". It is unclear which resin is being described. In claim 1, it is suggested to (1) on line 4 change "a resin" to --said prepreg resin-- and (2) on line 6 change "said resin" to --said prepreg resin--.

Claims 7 and 8 describe "the curing temperature range". There is no antecedent basis for "the curing temperature range" and, as such, the scope of "the curing

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temperature range" is unclear. More specifically, it is unclear which temperature range is required. Furthermore and as a related matter, it is unclear what additional limitation is required in claim 7; it being noted that claim 1 requires a minimum viscosity of 150-1500 poise and claim 7 (dependent on claim 1) requires a minimum viscosity having the same range of 150-1500 poise.

In claim 24, there is no antecedent for "said fabric layer" and as such, it is unclear if claim 24 (indirectly dependent on claim 1) is further defining "fiber layer" as being "a fabric layer".

5) The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6) **Claims 1-2, 7-11, 16-18, 21, 23-27, 30-32 and 35-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kishi et al (EP 819723, already of record) in view of Recker et al (EP 392348, cited in IDS filed 7-6-04).**

Kishi et al, directed to fiber reinforced composites for applications such as airplanes, discloses a self adhesive prepreg comprising reinforcing fibers in the form, for example, of a fabric; epoxy resin; curing agent; and additives wherein the minimum viscosity during heating is 30 - 400 poise (abstract, page 4 lines 26-34, page 5 lines 14-28, page 9 lines 46-47). Kishi et al teaches bonding the self adhesive prepreg on a honeycomb core by arranging the self adhesive prepreg on the top and bottom of the honeycomb core and heating to cure the resin (see abstract and page 12). The

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honeycomb sandwich panel is high in skin panel strength and excellent in impact resistance (abstract, page 13 lines 6-10). As to selection of the additives, Kishi et al discloses selecting thermoplastic resin such as polyethersulfone or polyetherimide (page 8 lines 27-29). Kishi et al indicates that these thermoplastic resins are soluble in the epoxy resin (page 5 line 32). The additives change the viscoelasticity of the resin composition in order to optimize viscosity (page 5 lines 29-34, page 6 lines 24-27). Kishi et al teaches using a minimum viscosity of 30-400 poise to improve self adhesiveness and fillet formability (page 5 lines 15-19, 25-27). With respect to fillet formability, Kishi et al teaches:

If the viscosity of the resin is too low, the resin of the top skin panel tends to flow down too much along the honeycomb walls, and as a result, the bonding strength between the top skin panel and the honeycomb becomes insufficient. On the other hand, if the resin viscosity is too high, the resin cannot sufficiently wet the honeycomb walls, and especially the bonding strength between the bottom skin panel and the honeycomb core is liable to be insufficient.

See page 2 lines 34-38. In examples 1-8, example 5 had both the highest minimum viscosity (210 poise) and the highest peel strength. Organic particles such as fine particles of thermoplastic resin may be used *in addition to* the above additives wherein these organic particles are for improving toughness and self adhesiveness (page 8 lines 30-32, 44-49). Kishi et al discloses therefore a resin composition for a self adhesive prepreg comprising:

- (1) **epoxy resin** (thermosetting resin);
- (2) **curing agent**;
- (3) **soluble thermoplastic such as polyetherimide, polysulfone or polyethersulfone** for use in optimizing viscosity ("thermoplastic viscosity control agent"); and

(4) **thermoplastic fine particles** for improving toughness and self adhesiveness

wherein the minimum viscosity of the resin composition during heating is 30-400 poise.

Kishi et al does not recite that the additional thermoplastic fine particles are not dissolved to a substantial degree in the epoxy resin.

Recker et al, directed to fiber reinforced composites for applications such as aerospace field and transportation industries, discloses a resin composition for a fiber reinforced prepreg comprising:

- (1) **epoxy resin** (thermosetting resin);
- (2) **curing agent**;
- (3) **soluble thermoplastic such as polyetherimide, lower molecular weight polysulfone, or polyimide** wherein the soluble thermoplastic is totally or substantially soluble at the mixing temperature (page 5 lines 9-12 and example 3);
- (4) **differentially soluble engineering thermoplastic particles** such as polyethersulfone having a Tg greater than 200°C for increasing toughness of the resin system so that composite prepared therefrom exhibit "superior toughness" wherein the solubility of the differentially soluble thermoplastic in the epoxy resin at the mix temperature is minimal while the solubility at the cure temperature is both rapid and total (page 2 lines 1-5, page 3 lines 27-34, 48-54, page 4 lines 49-52).

With respect to adhesive property, Recker et al teaches that the composition may be used as an adhesive (page 1 lines 1-5, page 9 lines 4-8). With respect to viscosity, Recker et al teaches that the use of addition of solvents to decrease viscosity is not preferred (page 8 lines 42-47). This teaching suggests avoiding a viscosity that is too low.

As to claim 1 (prepreg), it would have been obvious to one of ordinary skill in the art to use Recker et al's differentially soluble thermoplastic particles in Kishi et al's epoxy resin composition for a prepreg such that the epoxy resin composition comprises differentially soluble thermoplastic in combination with soluble thermoplastic (e.g. polyetherimide) since Recker et al, also directed to a fiber reinforced epoxy prepreg, suggests including differentially soluble thermoplastic particles along with soluble thermoplastic (e.g. polyetherimide) in an epoxy composition for a prepreg so that composites formed therefrom exhibit superior toughness. Hence, Kishi et al teaches using soluble thermoplastic (a viscosity control agent) such as polyetherimide in an epoxy composition such that the minimum viscosity is 30-400 poise (overlapping the claimed range of 150-1500 poise). Recker et al motivates one of ordinary skill in the art to additionally include differentially soluble thermoplastic particles in the epoxy composition so that composites made using the composition exhibit superior toughness. Improved toughness is desired by Kishi et al since Kishi et al suggests that thermoplastic particles may additionally be included in the composition to improve toughness (page 8 lines 30-32 and 43-49). As to reasonable expectation of success, one of ordinary skill in the art would find the use of Recker et al's differentially soluble thermoplastic particles suitable in Kishi et al's composition which includes soluble thermoplastic since Recker et al teaches using the combination of **soluble thermoplastic and differentially soluble thermoplastic particles** with **epoxy resin** and **curing agent** to form an epoxy resin composition to be impregnated in fiber material such as a fabric. The claimed "thermoplastic viscosity control agent ... selected

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from the group consisting of polyetherimides and micronized polyethersulfone" reads on soluble thermoplastic such as polyetherimide suggested by Kishi et al and Recker et al. The claimed "thermoplastic fillet forming particles" read on Recker et al's "differentially soluble thermoplastic particles". No unexpected results over the applied prior art has been shown.

As to claim 17 (method), it would have been obvious to one of ordinary skill in the art to adhesively bond the prepreg to a honeycomb such that the particles dissolve during curing as claimed in view of (1) Kishi et al's teaching to laminate the prepreg to a honeycomb core and to cure the resin and (2) Recker et al's teaching that the differentially soluble thermoplastic resin dissolves in the epoxy resin during curing.

claims dependent on prepreg claim 1

As to claim 2, Kishi et al and Recker et al teach using epoxy resin.

As to claims 7 and 8, Kishi et al suggests a minimum viscosity of 30-400 poise - 400 poise falling within the claimed ranges.

As to claim 9, Recker et al teaches: "During prepregging of fiber reinforcement, a substantial amount of these particles are filtered out by the reinforcing fibers, forming a thermoplastic particle rich zone substantially exterior to the fibers." (page 3 lines 32-35)

As to claims 23-25, it would have been obvious to use the prepreg to form the claimed honeycomb having the claimed core crush in view of (a) the epoxy resin composition suggested by Kishi et al and Recker et al and (b) Kishi et al's teaching to

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(i) use carbon fibers for the reinforcing fibers of the prepreg (page 9 line 35), (ii) use a woven fabric comprising fiber bundles having 2500 to 25000 filaments (page 9 lines 52-58) and (iii) use the prepreg to form a honeycomb sandwich panel (page 12).

As to claim 26, Kishi et al teaches tetraglycidyl diaminodiphenylmethane.

See page 5 line 39.

As to claim 27, Kishi et al teaches using dicyandiamide as the curing agent.

See page 6 line 5.

As to claims 10, 11, 16 and 30-32 (cured honeycomb panel), Kishi et al teaches using the prepreg to form a cured honeycomb sandwich panel (page 12).

claims dependent on method claim 17

As to claim 18, Kishi et al and Recker et al teach using epoxy resin.

As to claim 21, Recker et al teaches a particle size of 2-35 microns.

As to claim 35, Kishi et al teaches tetraglycidyl diaminodiphenylmethane. See page 5 line 39.

As to claim 36, Kishi et al teaches using dicyandiamide as the curing agent. See page 6 line 5.

7) Claims 29, 34 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kishi et al in view of Recker et al as applied above and further in view of Hayes (US 3530087).

As to claims 29, 34 and 38, it would have been obvious to one of ordinary skill in the art to use micronized polyethersulfone particles as the soluble thermoplastic resin since (1) Kishi et al suggests using the soluble thermoplastic resin, which may be

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polyethersulfone, in the epoxy resin for optimizing viscosity for proper fillet formation and (2) Hayes, directed to the problem of obtaining good filleting properties for honeycombs (col. 1 lines 36-62), teaches that *finely ground* polysulfone ("micronized" polysulfone) permits the polysulfone to dissolve in epoxy resin at a lower temperature.

Furthermore, it would have been obvious to use trifunctional epoxy, difunctional epoxy, aromatic curing agent, the soluble thermoplastic ("viscosity control agent") and the differentially soluble particles ("fillet forming particles") in the claimed amounts in view of (1) Kishi et al's teaching to (i) use at least a bifunctional epoxy resin and a trifunctional epoxy resin together so that resin flowability and heat resistance after curing can be satisfied (page 5 lines 48-50), (ii) use an aromatic curing agent such as diaminodiphenylsulfone for obtaining cured products with good heat resistance, and (iii) use additive such as thermoplastic resin (e.g. polyethersulfone) to optimize viscosity and (2) Recker et al's teaching to use 10-50% (preferably 15-25%) by weight based on total resin weight of the differentially soluble thermoplastic particles for improving toughness. No undue experimentation for determining the claimed amounts would have been required in view of the above noted guidance as to the desired properties to be obtained by using each component.

8) Claims 3-5, 12-14 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kishi et al in view of Recker et al as applied above and further in view of Ghali et al (US 4945154) and optionally Portelli et al (US 5368922).

As to claims 3-5, 12-14 and 19-20, it would have been obvious to one of ordinary skill in the art to use densified polyethersulfone as the differentially soluble

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thermoplastic particles since (1) Recker et al teaches using polyethersulfone particles having a Tg above 200°C as the thermoplastic particles, which improve toughening and are substantially insoluble in the epoxy resin at the mix temperature, (2) Ghali et al, which recognizes that viscosity of matrix resin increases if conventional polyethersulfone particles dissolve therein (col. 1 lines 42-45), suggests using densified polyethersulfone particles as a toughening agent since densified polyethersulfone particles can be added to epoxy resin without significant increase in viscosity and optionally (3) Portelli et al teaches that thermoplastic particles, which are insoluble at processing temperature and soluble at curing temperature include densified thermoplastic particles having a Tg above 140°C.

9) Claims 6, 15 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kishi et al in view of Recker et al and Ghali et al and optionally Portelli et al as applied above and further in view of Hayes et al.

As to claims 6, 15 and 22, it would have been obvious to one of ordinary skill in the art to use micronized polyethersulfone particles as the soluble thermoplastic resin since (1) Kishi et al suggests using the soluble thermoplastic resin, which may be polyethersulfone, in the epoxy resin for optimizing viscosity for proper fillet formation and (2) Hayes, directed to the problem of obtaining good filleting properties for honeycombs (col. 1 lines 36-62), teaches that *finely ground* polysulfone ("micronized" polysulfone) permits the polysulfone to dissolve in epoxy resin at a lower temperature.

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10) Claims 9 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kishi et al in view of Recker et al as applied above and further in view of Maranci et al (US 4957801).

The limitation of "located substantially at said bonding surface" is considered to read on the thermoplastic particle rich zone disclosed by Recker et al (page 3 lines 33-35). In any event: It would have been obvious to one of ordinary skill in the art to provide the differentially soluble thermoplastic (polyethersulfone particles) such that they are located substantially at the prepreg surface in view of Maranci et al's teaching to apply thermoplastic particles (e.g. polyethersulfone particles which dissolve during cure of the epoxy resin) to a surface of the prepreg so that laminated composites formed therefrom have improved toughness and impact strength.

11) Claims 28, 33 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kishi et al in view of Recker et al as applied above and further in view of Japan '619 (JP 3-24361).

As to claims 28, 33 and 37, it would have been obvious to one of ordinary skill in the art to use dicyandiamide and 3,3'-diaminodiphenylsulfone as the curing agent in view of (1) Kishi et al's teaching to use a curing agent such as dicyandiamide or diaminodiphenylsulfone for the epoxy resin, (2) Recker et al's suggestion to use curing agent such as 3,3'-diaminodiphenylsulfone for epoxy resin and (3) Japan '619's teaching to use a curing agent comprising dicyandiamide and diaminodiphenylsulfone for an epoxy resin composition.

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Remarks

12) Applicant's arguments with respect to claims 1-38 have been considered but are moot in view of the new ground(s) of rejection.

In view of the statement at the bottom of page 9 of the response filed 7-6-04, Zhou et al '910 and Zhou et al '257 have been excluded as prior art under 35 USC 103(c).

The 35 USC 112 first paragraph rejection and 35 USC 102(e) rejection over Zhou et al '910 or Zhou et al '257 has been withdrawn. Zhou et al '910 and Zhou et al '257 are not available as 102(e) prior art against claims 26, 31 and 35 as amended in the response filed 7-6-04 and entered per the RCE since claims 26, 31 and 35 are directed solely to the subject matter of the parent applications.

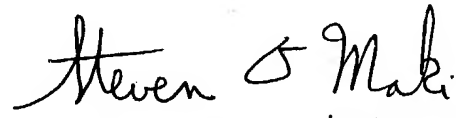
13) Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven D. Maki whose telephone number is (571) 272-1221. The examiner can normally be reached on Mon. - Fri. 7:30 AM - 4:00 PM.

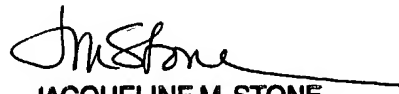
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Blaine Copenheaver can be reached on (571) 272-1156. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Steven D. Maki
October 27, 2004


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